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Original Research

The SII index can predict mortality in the elderly in the emergency room

Systemic immune inflammation index in predicting mortality in elderly emergency room

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Abstract

Aim: In this study, we aimed to predict mortality with systemic immune inflammation index in geriatric patients with a high quick sequential organ failure assessment score in the Emergency Room critical care unit.

Material and Methods: The study included 200 geriatric emergency room critical care patients with a quick sequential organ failure assessment of ≥ 2. The patients were divided into two groups: mortal and non-mortal. Diagnostic test performances of systemic immune inflammation index scoring were evaluated in the study using the mortality variable. The outcomes of the patients in the emergency department were evaluated. Statistical analyses were performed to compare the groups.

Results: The mean age was 76,8±7,0. The systemic immune inflammation index score was above 648, with 100% sensitivity and 31.9% specificity. Male patients had a significantly higher systemic immune inflation index than females (p=0.047; p<0.05). Mortality was higher in patients with a high index score (p=0.010; p<0.05). A weak positive correlation was found between the patients' systemic immune inflammation index scores and Alanine Aminotransferase, Blood Urea Nitrogen, and creatinine values (r=0.164, r=0.182, and r=0.152, respectively). A weak negative correlation was found between the sodium value and the index score (r=-0.213).

Discussion: The systemic immune inflammation index can predict mortality in geriatric patients with a high quick sequential organ failure assessment score admitted to the emergency department. The index may be a more useful predictor of mortality in male patients than in female patients. There may be a relationship between the Alanine Aminotransferase, Blood Urea Nitrogen, and creatinine value changes in patients and the index.

Keywords

Geriatrics, Emergency Room, Sepsis, Inflammation

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Introduction

A scoring guideline is very important in choosing which patients admitted to the emergency department will die, be discharged home, or be hospitalized. Scoring guides emergency physicians in terms of examination and treatment. Predicting the mortality of patients and early intervention are very important for saving patients' lives.

Early diagnosis becomes more important, especially for patients in special groups having the red flag and with difficulties in diagnosis and treatment in the emergency room. One of these was the elderly patient group. It is necessary to move away from the classical patient approach, which complicates our work both at the point of diagnosis and at the point of treatment. A more personalized method should be followed, especially for patients aged ≥ 65 years. The response to sepsis may be suppressed by these drugs. Alternatively, the sepsis status of the patient may be noticed late owing to the effects of the drugs. There is a need for practical tools that do not delay the diagnosis of elderly patients and guide the diagnosis of intensive working emergency services.

Sepsis is a state of organ dysfunction caused by the dysregulated host response to infection. It is a critical condition leading to a high mortality rate and a significant worldwide health problem. Sepsis incidence increases with age, especially in very elderly patients (age ≥80 years), and mortality is also significantly higher in this population [1]. This high incidence and mortality could be explained by various reasons, such as multiple pre-existing comorbidities, reduced functional reserve, and abnormal immune system [2]. Sepsis diagnosis is also more difficult, given elderly patients' vague symptoms and atypical clinical presentations. This poses an extreme challenge for emergency physicians in recognizing such patients early, especially those at a greater risk of adverse outcomes. Although the mortality rate due to sepsis is exceptionally high in geriatric patients, little is known about the predictive factors of this adverse outcome, and new predictors should be identified.

The Systemic immune inflammation (SII) index a novel inflammatory marker associated with the clinicopathological features and prognosis of several types of cancer, such as colorectal cancer, breast cancer, hepatocellular carcinoma, and PC [3]. The SII is calculated using the following formula: SII = platelet count × neutrophil count/lymphocyte count. Recent studies have used the index in different groups such as COVID-19 [4], coronary artery disease [5], acute pancreatitis [6], and aneurysmal subarachnoid hemorrhage [7]. This study aimed to use the systemic immune-inflammation index (SII index) to predict mortality in the elderly and very elderly patients with sepsis admitted to the emergency room (ER).

Material and Methods

After receiving the approval of the ethics committee, the study was started.

The study included elderly patients with sepsis and very elderly patients who were admitted to the ER department of Basaksehir Cam and Sakura City Hospital between May 1, 2021, and May 1, 2022. Patients aged ≥65 years were referred to as elderly, and those aged ≥85 years as very old. The quick sequential organ failure assessment (qSOFA) score was used to select patients with sepsis. Patients with a qSOFA score of ≥ 2 were included in the study.

In the study, we used Systemic Immune Inflammation Index (SII index) formula. SII index formula: (neutrophil count x lymphocyte count)/platelet count.

We took the patients' blood sample results and noted the Complete Blood Count (CBC) to get neutrophil, lymphocyte and platelet counts.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) 25.0 package program was used for the statistical analysis of the data. Categorical measurements are summarized as numbers and percentages, and continuous measurements are presented as mean and standard deviation (median and minimum-maximum where appropriate). Chi-square and Fisher's exact tests were used to compare categorical expressions. The Shapiro-Wilk test was used to determine whether the parameters in the study were normally distributed. The Mann-Whitney U test was used for parameters that did not show a normal distribution. The sensitivity and specificity values of the SII Index score were calculated based on the mortality variable of the patients included in the study, and the cut-off value was determined by examining the area under the receiver operating characteristic (ROC) curve. The statistical significance level was set as 0.05. Consent was obtained from all patients included in the study.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

The diagnostic test performance of SII index scoring, which was evaluated using the mortality variable in the study, is shown in Table 3. Accordingly, the SII index score was above 648, the SII index was 100%, and the specificity was 31.9% (Table 1).

The frequency of the female gender was higher in patients with a high SII index (p=0.047; p<0.005). Mortality was higher in patients with a high SII index (p=0.010; p<0.05). (Table 2)

A weak positive correlation was found between the patients' SII index scores and ALT, BUN, and creatinine values (r=0,164; r=0,182; r=0,152). A weak negative correlation was found between the Na and SII index (r=-0.213) (Table 3).

Table 1. SII Index Diagnostic Test Performance.

	SII index
AUC 95%-CI (%)	0,678 (0,602-0,748)
Cut-off	>648
Sensitivity (%)95%-CI (%)	100 (66,4-100)
Specificity 95%-CI (%)	31,9 (24,7-39,7)
PPV 95%-CI (%)	7,6 (6,9-8,4)
NPV 95%-CI (%)	100 (100-100)
p	0,038*

* p<0,05, **p<0,001, Roc curve test

Table 2. Comparison of the SII index and the demographic and clinical characteristics of patients.

	SII Index score		p[a]
	Low (n=82)	High (n=118)	
Gender			
Female	53 (64,6)	61 (51,7)	0,047*
Male	29 (35,4)	57 (48,3)	
Mortality	-	9 (7,6)	0,010*
Age			
<85	50 (61,0)	75 (63,6)	0,71
≥85	32 (39,0)	43 (36,4)	
	Med±ss	Med±ss	p[b]
Age	77,0±7,6	76,6±6,6	0,828
Body temperature	36,5±0,6	36,5±0,7	0,896
Pulse	87,8±19,5	84,0±25,7	0,231
Systolic tension	123,8±27,2	124,9±33,4	0,595
Diastolic tension	72,8±15,0	70,0±20,7	0,137
SPO_2	94,3±4,7	93,1±7,2	0,56
qSOFA	2,09±0,3	2,10±0,3	0,699

* p<0,05, a: Chi-square and Fisher's exact test, b: Mann-Whitney U test

Table 3. Comparison of the SII index and blood test results.

	SII index score	
	r	p
pH	0,106	0,172
PCO_2	-0,108	0,161
HCO_3	-0,008	0,914
Lactate	0,106	0,169
Glucose	0,114	0,141
AST	0,033	0,667
ALT	0,164*	0,033
BUN	0,182*	0,018
Creatinin	0,152*	0,049
Na	-0,213**	0,005

* p<0,05, **p<0,001, Spearman's correlation test

Discussion

The recognition of sepsis and the prediction of mortality in elderly patients at risk is very important for diagnosis and early treatment initiation. The data obtained from these studies showed that the SII index score could predict mortality in elderly patients with 31.9% specificity and 100% sensitivity. Previous studies have shown different cut-off values (≥2207.53, ≥960, ≥2519.89± 2188.53, 694 [3] related to mortality [4,5,6,7,8]. In this study, an SII index value of ≥ 648 was found to be closely associated with mortality (p=0.038).

The SII was a better predictor of mortality in female patients. Corresponding data on this subject were not found in the literature. The SII index score was higher in mortality cases (p=0.010). These data can be used as a predictor of the SII index in estimating mortality in patients with sepsis aged ≥ 65 years admitted to the emergency department. Similar results are found in the literature, although the cut-off values vary in studies conducted in different fields.

Considering the blood test results, no correlation was found between the SII index and lactate levels. Further studies are required to investigate whether patients' lactate levels do not increase despite sepsis, whether the lactate response develops slowly in elderly patients, or whether the SII index is more sensitive in predicting mortality. The results suggest that the increase in ALT, blood urea, and creatinine levels in elderly patients with sepsis may mean higher SII index scores and increased mortality; the opposite is also true. Further studies are required in this regard.

In light of the data, low blood Na values of elderly patients with sepsis admitted to the emergency department are associated with a higher SII index and increased mortality. A low SII index value of the patient indicates a higher Na value. Additional research is required to confirm these findings.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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